the unconstrained environment. While total surplus available to divide is unambiguously larger in the unconstrained case (as can be verified by comparing buyer payoffs in Tables A S and A.7), a buyer's expected payoff (computed as an average of the Core outcomes favoring buyers and Core outcomes favoring **sellers**) is in almost every case larger in the constrained environment. A comparison of the **seller's** expected payoffs (again computed **as** an average of the Core outcomes favoring buyers and Core outcomes favoring **sellers**) reveals in an even more striking manner that sellers unambiguously suffer when the capacity constraint is imposed. Every **seller** in every treatment can expect a lower payoff when there is a capacity constraint. Moreover, the payoffs for the two smallest **sellers** change from positive to negative when the capacity constraint is imposed.

A.5.2 Avoidability and Unavoidability of Costs

The experiments are constructed to shed light on the following hypothetical — would existing cable networks have difficulty recovering their costs if they had to conduct a series of multi-lateral negotiations with cable operators? Implementing this hypothetical involves assigning costs to both buyers and **sellers.** These assigned costs are properly viewed as unavoidable for purposes of this analysis.'" To what extent, however, does the unavoidability of these costs affect the bargaining outcomes?[105]

Table A.8 presents the Shapley Value solutions to the bargaining game between the cable operators and cable networks where the costs incurred by each are "avoidable."[106] An avoidable cost is one that need not be incurred in the short run if the **seller** determines that there are not sufficient revenues fiom trade to make it worthwhile

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[101] **A** comparison of the Shapley Value outcomes for the capacity constrained and unconstrained cases reveals a similar, though less extreme behavior compared to the Core.

[104] In the unavoidable cost framework, we assume that buyers and sellers bargain over the gross surplus available from trade. **and** after all pair-wise bargains are agreed upon, the costs are subtracted.

[105] This is an important question. In an interesting paper, Alex Raskovich of the Department of Justice has shown that, in a market where a seller conducts bilateral trades with multiple buyers, a buyer's bargaining power may decline if the buyer becomes larger. Whether bargaining power declines depends on whether the buyer becomes "pivotal" in the sense that the payments contributed by other buyers falls short of the supplier's avoidable costs. To enjoy the benefits of a trade with the seller, the pivotal buyer **must** make up for this shortfall. In making up for the short fall, the surplus enjoyed **by** the pivotal **buyer** is less than the surplus it could enjoy if the **firm** were broken up. Understandably, the results are based on several assumptions, one of which is that the seller's costs are avoidable. The current analysis sheds light on the importance of this assumption.

[106] **A** comparison of Core outcomes in the avoidable cost and unavoidable cost cases reveals similar results to the comparison of Shapley values.

to bear it. Thus, avoidable costs are equivalent to an assumption that exit from the market is both possible and relatively costless. In the avoidable cost framework, no buyer's or **seller's** costs are incurred unless that trader makes a contribution to the net surplus of the coalition (after accounting for costs). The main difference between the two theoretical setups is that negative *ex* post profits are possible in the unavoidable cost case. but not in the avoidable **fixed** cost case.[107]

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	119	126	945	2297	1319	784	984	1472	799
High/ High	122	126	989	2451	667	529	2835	356	724
High/ LOW	124	133	1005	2507	1970	2324			**816**

Table A.8: Shapley **Value Solution Outcomes**
(Capacity Constraints and Avoidable Costs)

A comparison of Tables **A.3** and **A.8** reveals that sellers uniformly gain and buyers uniformly lose in the avoidable cost-capacity environment relative to the unavoidable cost environment. Furthermore, the weakest (i.e., smallest) **sellers** gain relatively the most in going from one environment to the other.[108] The intuition behind these results is straightforward. Total net surplus is somewhat larger in the avoidable cost case since not all sellers are required to actively produce in the grand coalition outcomes. Moreover, for a given **seller,** the incremental surplus achieved when joining a coalition must always be larger in the case of avoidable costs than in the case of unavoidable costs. This is true because the incremental surplus contributed to the coalition by the seller is either positive and identical in the two situations or **zero** in the

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[107] An important consequence of the unavoidable cost assumption is that all **sellers** should optimally remain active in the market at all times. In the case of avoidable *costs,* it may be optimal from both **a** social surplus and individual profit perspective for some sellers to exit the market in **any** given period.
[108] **As** previously noted, negative profits are possible in the unavoidable cost case, but not in the avoidable cost case.

avoidable cost case and negative in the unavoidable cost case. However, **for** buyers the situation is reversed. In the case of unavoidable costs, a given buyer's incremental contribution to total surplus is just equal to the buyer's gross gains from trade with all existing sellers in the coalition. In the case of avoidable costs, there are situations in which a given seller would not find it worthwhile to incur its costs before a buyer joins the coalition, but would be willing to incur those costs with the buyer present. In this case, the incremental surplus attributable to the buyer is responsible for covering a portion of the sellers fixed cost.[109]

These observations suggest that the manner in which buyers and sellers view their costs while attempting to conduct a set of trades may be critical in determining bargaining outcomes. From an economic point of view, the critical issue is whether, and to what extent, these costs are avoidable in the short run. The threat of exit from the market, and the resulting harm that potential buyers of the sellers' product may incur, can be a powerful tool to increase the bargaining power of sellers in any market.

A.6   Some Caveats in Interpreting the Cooperative Solutions

The axioms or assumptions upon which the three cooperative solutions are based make it possible to make specific predictions regarding bargaining outcomes. However, some of these assumptions may not hold in practice. For example, the Nash Bargaining solution assumes that only those trades that generate the most surplus are conducted. The Shapley value assumes that all coalitions are equally likely to form, as players evaluate their marginal contributions to the game. The Core assumes that coalition formation **is** costless, so that the surplus obtained by any sub-coalition of the grand coalition constrains the payoffs enjoyed by members of the grand coalition. More generally, the efficiency assumption may not hold given the multi-lateral nature of the bargaining process. The three cooperative solutions that we have examined assume that trades take place simultaneously. However, trades between buyers and sellers occur in a sequential manner in the naturally occurring environment. Given the presence of previously incurred costs, the sequential nature of these trades creates profitability uncertainty for

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[109] This point is closely related to the observation made by Raskovich (2001) in his analysis of the role of "pivotal" buyers in a market in which sellers regard their fixed **costs** as avoidable.

the sellers.[110]   This uncertainty may substantially affect the bargaining outcomes between buyers and sellers.[111]   Finally, none of the cooperative solutions examined capture the effect of expectations of individual buyers or sellers on the gains that could be expected to be achieved from future trades in a given trading period.

A.7   Testing the Theoretical Predictions

In this section we review the experimental results in light of the predictions made using the cooperative game theory described above. In our basic treatment consisting of a capacity constraint on buyer purchases and unavoidable fixed costs, which corresponds to the experimental design in **15** of the experiments, we computed solution values for the Nash Bargaining Solution, the Shapley value and the Core. These values are shown in Tables **A.2** through **A.5.** In Table **16** in the main body of the paper, we presented the average values of the 112 experimental data points that correspond to the basic treatment case (i.e., CAP, No MFN treatment).[112]

A comparison of Table **16** with Tables **A.2** through **A.5** reveals that the smallest sellers (#1 and **#2)** receive lower payoffs in the experiments than they do under either the Nash Bargaining Solution or the Shapley value predictions, but higher payoffs than any of the Core predictions. The largest seller (#4), on the other hand, does better in the experiments than is predicted by the Nash Bargaining Solution or Shapley value, though not as well as the best Core outcome. The buyers' payoffs seem to be broadly consistent with both the Nash Bargaining Solution and Shapley value outcomes, as well as with the average of the extreme Core outcomes.

In order to provide a more quantitative estimate of the predictive power of the cooperative game solutions, we computed an average distance measure between the

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[110] **MVPDs** also enter the bargaining game with some costs.

[111] Because of this uncertainty, trading outcomes may be due, in pan, to the expectations that buyers and sellers have regarding the prices at which future trades may take place and their willingness to assume risk. **An** important issue for the development of a more complete theory involves the proper method of introducing expectation formation and risk into the theory.

[112] **As** noted earlier, substantial care must be **taken** in interpreting these results. With the exception of Buyer #5 (i.e., the DBS operator), the market share accounted for by a given buyer changes across treatments.   This problem does not exist with sellers, given that their size remains constant across concentration treatments.

theoretical solution and the set of experimental data points.[113] These distance statistics are reported in Table **A.8** for the three solution concepts. This table reveals that the Nash Bargaining Solution offers the best "fit" to the data, with the Shapley value a close second. The average of the Core outcomes is less predictive overall than the more "cooperative" solutions, but the Core does capture the fact that small **sellers** suffer relative to large sellers in this market environment. albeit in a more extreme manner than the experiments revealed.

Treatment	Nash Bargaining Solution	Shapley Value	Average of Core Outcomes
High/Low	1842	1896	2122
High/High	1805	1919	2305
Low/High	2379	2510	2999

Table A.8: Average Distance of Cooperative Solutions from Experimental Data Points

A.8   Summary of the Theoretical Results

The examined solution concepts provide the following insights. In the presence of a trading constraint and where competition among sellers is strong (as in the case of the Core), sellers incur **losses.** In instances where competition is not as strong (as in the Nash Bargaining solution and Shapley value), sellers could conduct a set of trades that allows them to more than cover their costs. Importantly, all solution concepts predict that the welfare of **sellers** is not affected by the degree of concentration among buyers. In instances where competition among **sellers** is strong, as when capacity constraints are in effect. small **sellers** can expect to lose money uniformly whatever the level of concentration on the buy side of the market. Finally, we have shown that the amount of surplus a buyer and seller achieve in trade depends upon the degree **to** which the **sellers'** costs are avoidable

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[113] **That is, we computed the Euclidean distance between each theoretical solution and each** of **the data points representing net surplus achieved in a trading period. We then summed these values and divided by the number** of **observations.**

It is worth noting that fiom a computational point of view it would be possible to impose a capacity constraint on the number of trades that each **seller** is permitted to make in any trading period. Following this logic would reveal that such a constraint would work to the advantage of the sellers in exactly the same way as the trading constraint on buyer trades works to the advantage of buyers. However, in the bargaining fiamework between cable operators and cable programming networks. a constraint on seller transactions is not plausible for a number of reasons. In contrast to the natural constraint on channel capacity that cable operators face, for any given cable delivery technology, there is no corresponding constraint on the number of cable operators a given cable network can sell to. For sellers, the marginal cost of selling to an additional buyer is essentially zero.

Even if channel capacity can be viewed as unlimited based on available delivery technologies (e.g., through digital technologies and fiber delivery systems), cable networks ultimately compete for cable subscribers' viewing time. Hence, cable networks are inherently substitute products from a cable operator's point of view. At some point the carriage of an additional cable network will reduce the advertising revenue earned by cable networks and cable operators. This reduction in revenue will, at some point, exceed the additional subscriber revenue earned by cable operators fiom carrying an additional cable network. These economic effects occur even if the cable operator has unlimited channel capacity. The relevant constraint is the cable subscribers' viewing time.

Finally, any given cable operator can make a strategic decision to limit the number of cable networks that it chooses to carry, without obtaining the cooperation of other cable operators. In contrast, given the substitutability of cable networks, any attempt by the cable networks to limit the number of programs sold by each network for strategic reasons would require a coordinated action by all networks.

Appendix B: Subject Instructions

Experiment Instructions – Buyers (No Cap, No MFN)

I.   Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants, except as permitted under the rules of the experiment. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset. buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer and may differ across buyers. Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. Sellers will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. Sellers will also be assigned a schedule of payments that a thud party provides them in the event of a trade between a seller and a buyer.

Buyers have the opportunity to purchase an asset from different **sellers,** while sellers have the opportunity to sell their respective assets to multiple buyers. From this point forward, you will be referred to by your bidder number. which **is** bidder number _____. You are a BUYER in this experiment. There are four sellers and five buyers in your market.

II.   Earnings

Participants have the opportunity to conduct trades during a **series** of independent trading periods. Buyers earn money by purchasing assets at prices below their assigned resale value that exceed their fixed cost. **Sellers** earn money by selling their assigned assets to one or more buyers at prices, when combined with a thud party payment that exceed their fixed cost. The following section describes how you calculate your earnings.

I. Instructions for Buyers

Each buyer has the opportunity to buy a single asset 6om each of the four **sellers** (labeled **Seller** 1, 2, 3. and 4). You will be assigned a resale value for each potential trade. Resale values may differ among buyers. You are strictly prohibited from revealing your resale values to anyone. While you can conduct a trade with any **seller** during a trading period, you may only complete —— trades in a given period. If you buy an asset 60m a **seller,** your earnings from the trade are equal to the difference between your resale value for that asset and the price you paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

Suppose, for example, that you traded with **Seller** 1 and that your assigned resale value for this asset is 644 experimental dollars. If you pay 300 experimental dollars for a trade with **Seller** 1, then your earnings **are:**

TRADE EARNINGS = 644 – 300 = 344 experimental dollars

Your total profits in any trading period are equal to **the** sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

For example, suppose your fixed cost was 110. Suppose that during the same trading period you traded with Seller 2 and that your assigned resale value for this asset is 120 experimental dollars. If you pay 70 experimental dollars. then your total earnings in that trading period are:

$$\text{SUM OF TRADE EARNINGS} = \mathbf{344 + 50} = \mathbf{394} \text{ experimental dollars}$$

$$\text{TOTAL PROFITS} = \mathbf{394 - 110} = \mathbf{284} \text{ experimental dollars}$$

The following record sheet, which you should always use to calculate and record your earnings from each trade, displays your total earnings in this trading period.

Trading Period	Trade	Seller	Resale Value	- PRICE	= Earnings
	1	1	644	300	344
	2	2	120	70	50
	3				
	4				
	-Fixed Costs				-110
	TOTAL				**284**

You incur a loss on any particular trade if the price you paid for an asset exceeds your assigned resale value for that asset. You incur a loss in a trading period if the sum of your trade earnings does not exceed your fixed costs. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7 show up fee and will be asked to leave the experiment.

2. Information on **Sellers**

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer *5, 6,* 7, **8,** and 9). Before the trading period, sellers will be assigned one of the assets and a fixed cost. The level of the assigned fixed costs may differ across assets. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore, sellers are free to **sell** to one or more buyers. However, sellers may only trade with each buyer only once in a trading period.

The sale of an asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to the seller in the form of a fixed payment the level of which is known only by the seller. This thud party payment augments the revenue the **seller** obtains fiom selling the asset to a buyer.

Seller earnings from a trade are equal to the sale price, augmented by the third-party payment. That is:

$$\text{TRADE EARNINGS} = \text{SALE PRICE} + \text{THIRD PARTY PAYMENT}$$

While you do not know the exact size of the thud party payment any seller receives, you can reasonably infer that sellers for whom you have **a** higher resale value are likely to have higher thud party payments, and sellers fiom whom you have a lower resale value are likely to have lower thud party payments.

111. Trading Process

(**NOTE A** COMPUTER SCREEN SHOT **IS** PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last *6* minutes. Buyers and **sellers** have the opportunity to conduct a set of trades through a series of bilateral negotiations. **A** buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is

offered.   A buyer can place a bid by typing a bid amount in the "Price" box located in the center of the screen and typing the number of the **seller** (1.2. 3, or **4)**to whom the bid is offered in the "Offered To" box located immediately below the Price box. A buyer submits the bid by pressing the "PLACE B I D button. Each bid can be sent to only ONE seller, and only that seller will **see** the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price **("ASK')** into the computer and identifying to whom the ask is offered. Each ask can be sent to only ONE buyer, and only that buyer will **see** the bid. An ask indicates that the **seller** is willing to sell at any price at or above that amount

     A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand comer of the screen. The bids placed by you are in the upper right hand comer along with the identity of whom they were offered to. The asks that have been offered to you by various **sellers** can be seen in the lower right hand comer along with the identity of the seller making the offer. As a buyer, you accept an ask by highlighting the ask you wish to accept with your mouse and then pressing the "buy" button. If neither **an** initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. **A** buyer's revised bid must exceed its standing bid to that **seller,** while a seller's revised offer must be lower than its standing ask to that buyer. **As** long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with them again during this period.

     Information on completed trades can be seen in the upper center portion of the screen and in the lower **lefl** hand comer of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand comer shows all trades this period. It is important for you to pay attention to these screens as a **seller** may accept one of your bids causing a trade to be completed with you.

In order to make **sure** you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values and fixed costs:

Fixed Costs	25
Seller	Resale **Value**
1	30
2	40
3	50
4	70

1. Suppose you placed a bid to buy fkom Seller 2 at a price of 12. If that bid is accepted, what would be your earnings on the trade?

2. If that is your only trade, what would be your total profits?

3. Suppose that **Seller** 3 offered an ask of 44 to you. lf you accepted the ask, what would be your earnings on the trade?

4. If **Seller** 3's third party payment was 120 for the trade, what would have been Seller **3's** earnings on the trade?

5. How many times may you trade with each **seller** in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question.

Are there any questions?

Experiment Instructions – Sellers (No Cap, No MFN)

I.   Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into **U.S.** dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of **$7,** will be paid to you in private. You are not allowed to communicate with the other participants, except as permitted under the rules of the experiment. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or **sell** a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer and may differ across buyers. Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. Sellers will be assigned a particular asset and a previously incurred "fixed cost" fiom creating that asset. Sellers will also be assigned a schedule of payments that a thud party provides them in the event of a trade between a seller and a buyer.

Buyers have the opportunity to purchase one or more assets fkom the sellers, while **sellers** have the opportunity to sell their respective assets to one or more buyers. From this point forward, you will be referred to by your bidder number, which is bidder number _____. You are a SELLER in this experiment. There are four sellers and five buyers in your market.

II.   Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by purchasing assets at prices below their assigned resale value that exceed their fixed cost. **Sellers** earn money by selling their assigned assets to one or more buyers at prices, when combined with a third party payment that exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for **Sellers**

Each seller has the opportunity to sell a single asset to each of the four buyers (labeled Buyer 5, 6, 7, *8,* and 9). Before the trading period, you will be assigned one of the assets and a fixed cost. The level of the assigned fixed costs may differ across assets. You are not permitted to reveal your assigned fixed cost to anyone. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore. you are free to **sell** your asset to one or more buyers. However, you may only trade with each buyer only once in a trading period.

The **sale** of your asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to you in the form of a fixed payment the level of which is known only by you. This third party payment augments the revenue you obtain from selling your asset to a buyer. The following is an example:

Buyer	Third Party Payment
5	**30**
6	**40**
7	**50**
8	70
9	**22**

If you **sell** your asset to a buyer, your earnings from the trade. which are yours to keep, is equal to the sale price augmented by the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

Suppose, for example, that you are assigned a fixed cost of 200 experimental dollars. Suppose, Buyer **5** agrees to pay you 220 experimental dollars for this asset, then your earnings on this trade are equal to:

$$TRADE\ EARNINGS = 220 + 30 = 250$$

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

Suppose that during the same trading period you traded with Buyer **6** and that your assigned third party payment for this trade is 40 experimental dollars. If Buyer **6** agrees to pay you 70 experimental dollars, then your total profits in that trading period are:

SUM OF TRADE EARNINGS = 250 + 110 = 360 experimental dollars

TOTAL PROFITS = 360 – 200 = 160 experimental dollars

The record sheet shown below shows the transactions. Please use the enclosed record sheet to calculate and record your earnings during each trading period.

Trading				+ Third	
Period	Trade	Buyer	PRICE	Party	= Earnings
	-Fixed Costs				-200
	1	5	220	30	250
1	z	6	70	40	110
	3				
	4				
	5				
	TOTAL				160

You will incur a loss in the trading period if you do not generate enough revenue to cover your fixed costs. Please note that you will incur a loss on a particular trade if you agree to pay a buyer a price that exceeds the payment you receive from a third party from making that trade. You begin the experiment with _____ experimental dollars in working capital. If your **losses** ever exceed that amount, you will be paid your $7 show up fee and be asked to leave the experiment.

III. Trading Process

(NOTE: **A** COMPUTER SCREEN SHOT **IS** PROVIDED FOR *YOUR* REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and **sellers** have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. Each bid can be sent to only ONE seller, and only that seller will *see* the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price (**"ASK**) into the computer and identifying to whom the ask is offered. **A** seller can place an ASK by typing an ask amount in the "Price" **box** located in the center of the screen and typing the number of the buyer (5, 6, 7, 8, or 9) to whom the ask is

offered in the "Offered To" box located immediately below the Price box. A **seller** submits the ask by pressing the "PLACE ASK' button. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand side of the screen. The asks placed by you are in the lower right hand side along with the identity of who they were offered to. The bids that have been offered to you by various buyers can be seen in the upper right hand side along with the identity of buyer making the offer. As a seller, you accept a bid by highlighting the bid you wish to accept with your mouse and then pressing the **"sell"** button. If neither an initial bid nor an ask is accepted, a buyer **may** increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with them again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower lefl hand side of the screen. The upper center portion reports the most recent trade you have completed and the lower lefl hand side shows all trades this period. It is important for you to pay attention to these screens as a buyer may accept one of your asks causing a trade to be completed with you.

In order to make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values and fixed costs:

Fixed Costs	225
Buyer	**Thud** Party Payment
5	44
6	**70**
7	**52**
8	**122**
9	**34**

1. Suppose you placed an **ask** to sell to Buyer *6* at a price of 12. If that ask was accepted, what would be your earnings on the trade?

2. If that was your only trade, what would be your total profits?

3. Suppose that Buyer *5* offered a bid of **20** to you. If you accepted the bid, what would be your earnings on the trade?

4. How many times may you trade with each buyer in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come **by** to answer your question.

Are there any questions?

Experiment Instructions - Buyers (Cap, MFN)

I.   Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ **U.S.** dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You *are* not allowed to communicate with the other participants. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or **sell** a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a **role** as either a buyer or a **seller.** To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed ''resale'' value for each asset. Resale values may differ across assets for a given buyer. Buyers vary in "size," which is measured by the number of customers it serves. The larger the buyer, the higher its assigned **resale** value for an asset. The following table ranks buyers fiom largest to smallest and provides the number of customers served.

Buyer	Customers (Size Rank)
6	36 (1)
5	32 (2)
7	14 (3)

In a given trading period a seller may conduct trades with multiple buyers. In each trading period the two largest buyers (i.e., Buyer *6* and Buyer 5) are guaranteed to receive the lowest price fiom the **sellers** with whom they trade. Specifically, if either

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Buyer *6* or Buyer **5** agrees on a price that is higher than the price the **seller** agrees to conduct a trade with another buyer, each of these buyers get the lower price. In addition. Buyer *6* and Buyer **5** each receive the same price.

Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. These fixed costs may differ among buyers. At the beginning of the experiment **sellers** will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. These fixed costs may differ among **sellers.** Sellers will also be assigned a schedule of payments that a third party provides them in the event of a trade between a **seller** and a buyer. The larger the buyer, the higher the third party payment received by the seller. The level of the third party payment a given seller receives fiom a trade will vary across **sellers.** Buyers have the opportunity **to** purchase an asset fiom different **sellers,** while **sellers** have the opportunity to **sell** their respective assets to multiple buyers. Each buyer is limited to making three trades per trading period. You are a BUYER in this experiment. From this point forward, you will be referred to by your number, which is number _____ . There are four sellers and three buyers in your market.

II.   Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by: (I) purchasing assets at prices below their assigned resale value for those assets and (2) having the sum of these earnings exceed their assigned fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices that, when combined with a third party payment, exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Buyers

Each buyer has the opportunity to buy an asset fiom one or more sellers. The market includes four **sellers** (labeled **Seller** 1. 2. **3,** and 4). You will be assigned a resale value for the asset sold by each seller. You are strictly prohibited from revealing your

resale values to anyone. While you can conduct a trade with any seller during a trading period, you may only complete **3** trades in a given period. You may trade with a particular **seller** only once in a trading period. If you buy an asset, your earnings from the trade are equal to the difference between your resale value for that asset and the price you paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

Suppose, for example, that you traded with **Seller** 1 and that your assigned resale value for the purchased asset is 244 experimental dollars. Suppose further that you serve 20 customers. If you pay 4.0 experimental dollars/customer or, a total of 80 experimental dollars (4.0 * **20** customers) for **Seller** 1's asset, then your earnings are:

TRADE EARNINGS = 244 – 80 = 164 experimental dollars

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

For example, suppose your **fixed** cost was 110. Suppose that during the same trading period you traded with **Seller** 2 and that your assigned resale value for the purchased asset is 120 experimental dollars. If you pay a price of **2.0** experimental dollars per customer, or 40 total experimental dollars (= 2.0 * 20), then your total earnings in that trading period are:

SUM OF EARNINGS = (244 - 80) + (120 – 40) = 244 experimental dollars

TOTAL PROFITS = **244** – 110 = 134 experimental dollars

The following record sheet, which you should always use to calculate and record your earnings 6-om each trade, displays your total earnings in this trading period.

Trading Period	Trade	Seller	Resale Value	Price Per Customer	Customers	Total Price	Earnings = Resale Value – Total Price
1	1	1	244	4.0	x 20	80	164
	2	2	120	2.0		40	80
	3						
	- Fixed Costs						- 110
	TOTAL						134

You incur a loss on a trade if the price you paid for an asset exceeds your assigned resale value for that asset. You incur a loss in a trading period if the sum of your trade earnings is less than your fixed costs. If you are either Buyer **6** or Buyer 5 you may obtain additional earnings because the seller(s) with whom you have traded may have activated the provision that guarantees that you pay, expressed on a price/customer basis, no more than any smaller buyer. You will be informed at the end of each trading period whether you have obtained additionai earnings because of the activation of this guarantee. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7 show up fee and you will be asked to leave the experiment.

2. Information on Sellers

Each seller has the opportunity to **sell** a single asset **to** each of the five buyers (labeled Buyer 5, **6,** and 7). Each asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore,

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sellers are free to sell to one or more buyers. However, sellers may trade with each buyer only once in a trading period.

The sale of an asset to any buyer conveys a financial benefit to a thud party. a portion of which is transferred to the seller in the form of a fixed payment the exact level of which is known only by the seller. This third party payment augments the revenue the seller obtains from selling the asset to a buyer. The larger the buyer, the higher the third-party payment received by the seller.

Seller earnings 60 m a trade are equal to the sale price, augmented by the thud-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

III.   Trading Process

(NOTE: **A** COMPLTER SCREEN SHOT **IS** PROVIDED FOR *YOUR* REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last *6* minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. A buyer can place a bid by typing a bid amount in the "Price" box located **in** the center of the screen and typing the number of the seller (1, 2, **3,** or **4)** to whom the bid is offered in the "Offered To" box located immediately below the Price **box.** A buyer submits the bid by pressing the "PLACE BID" button. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to **sell** its asset to a particular buyer by entering an asking price ("ASK') into the computer and identifying to whom the ask is offered. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount

A buyer can accept an initial ask, or a **seller** can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. The bids placed by you are in the upper right hand corner along with the identity of the **sellers** to whom they are offered. The asks that have been offered to you by various sellers can be seen in the lower right hand corner along with the identity of **seller** making the offer. **As** a buyer. you accept an ask by highlighting the ask you wish to accept with your mouse and then pressing the "buy" button. If neither an initial bid nor an ask is accepted, **a** buyer may increase its standing bid and/or a **seller** may decrease its standing **offer. A** buyer's revised bid must exceed its standing bid to that **seller,** while a **seller's** revised offer must be lower than **its** standing ask to that buyer. **As** long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and should record the trade on their record sheet. Once you have traded with a particular **seller** in a period, you may not trade with that seller again during this period.

Information on completed trades can be seen in the upper center portion **of** the screen and in the lower **left** hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower **left** hand corner shows all trades this period. It is important for you to pay attention to these screens as a **seller** may accept one of your bids resulting in a trade with you.

In order to make **sure** you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to heip you.

Consider the following resale values, customers served, and fixed costs: